REMARKS

Claims 1-15 have been cancelled and equivalent claims 16-30 have been added and are pending here. Reconsideration and allowance of all pending claims is requested.

A substitute specification is provided. Applicant submits that the specification contains no new matter.

The Applicant has amended the claims for the purpose of clarification and to put the claims in standard US claim format.

Claims 2-15 were objected to as being of improper dependent form. Applicant has cancelled these claims and added new claims 16-30. Without concurring as to the propriety of the objection, Applicant submits the rejection has thus been obviated and should be withdrawn.

Claims 1-15 have been rejected as allegedly indefinite. Applicant submits that these rejections have been obviated for the same reason as above.

With regard to the term "cochlea", Applicant submits that the original term may be better translated as "screw conveyor". The term has been changed by this amendment.

Claims 1-15 stand rejected as allegedly anticipated by Unlu et al. Applicant submits that these rejections have also been obviated as above. With respect to new claims 16-30, Unlu fails to show numerous limitations of the claims, most of which were recited previously in claims 1-15. For example, Unlu fails to disclose a rotating furnace with a spiral element, a pouring channel that has a common angle of inclination with a surface of a rotating joint, as well as the claimed selection means. Other distinctions may also be seen. These features provide a system that avoids many of the drawbacks of prior systems.

In view of the patentability of the independent claim, as noted above, the dependent claims are further submitted to be patentable for at least the same reasons.

CONCLUSION

Should the Examiner be of the view that an interview would expedite consideration of the application, request is made that the Examiner telephone the Applicants' attorney at (619) 818-4615 in order that any outstanding issues be resolved.

Respectfully submitted,

/Mark Wieczorek/
Mark D. Wieczorek
Registration No. 37,966

Dated: February 19, 2009
Attorney for Applicant
Mayer & Williams PC
251 North Avenue West, 2nd Floor
Westfield, NJ 07090
Tel: (619) 818-4615
Fax: (908) 518-7795

SUBSTITUE SPECIFICATION (Marked Version):

TECHNICAL FIELD

[0001] An ~~O~~object of the present invention is a modular plant for the melting of metallic materials, especially aluminium scraps, comprising a rotating furnace characterized by the lack of use of a salty bath, and with direct pour~~ed~~ing of the melted metal in a spherical store~~a~~ge tank, an equipment for the selection and recovery of the slag of fusion, and a system of scavenging.

STATE OF THE ART

[0002] As ~~it~~ is known, ~~the~~ melting of ~~the~~ aluminium scraps, for the production of ingots for alloys, and also ~~the~~ remelting of the same aluminium ingots, is realized in ~~the~~ rotating furnaces, also called salty bath furnaces, in which ~~the~~ sea salt (usually mixed with carbonate of soda, salnitro and yellow prussiato of potassium) is melted by the heat produced in the furnace.

[0003] Salt is a good receiver and transmitter of heat and its addition is useful as a cover agent to prevent the oxidation of the metal in the fusion. At almost 1000° C, it reacts, englobing the slag of fusion of the aluminium scraps. The principal drawback of these furnaces is the production of a notable quantity of ~~refusals~~ refuse, essentially constituted by the salty products mixed to the slag of the process of fusion of the aluminium scrap. ~~It originates therefore p~~ Problems exist because of the disposal of this fuse, ~~these refusals and not always the r~~Recycling ~~of these refusals is~~ the refuse is not always possible ~~and~~ or convenient from an economic point of view, and impacts ~~because it engraves in notable way on~~ the final price of the ingot of aluminium.

SCOPE OF THE INVENTION

[0004] The ~~principal scope of the~~ present invention ~~is to~~ avoids the drawbacks of the preceding systems primarily by use of ~~plants realizing mainly~~ a rotating furnace for the fusion of primary and secondary aluminium that does not have to realize the fusion of the aluminium using a salty bath. ~~Other scope of the present invention is to realize~~ Another is the realization of a rotating furnace for the fusion of the primary and secondary aluminium, according with the preceding purposes, in which it is the direct and

continuous pouring of the fused metal in a spherical store tank without any interruption of the process of fusion, so that to improve the use of fuel, of workforce, of salty materials, and the safety conditions of the job.

[0005] ~~Other scope of the present invention~~ Another is to ~~get~~ obtain a plant of fusion of the aluminium ~~according with the preceding purposes,~~ that directly has an automatic and continuous system of selection and recovery of the slag of fusion integrated in the same plant, without ~~necessity of following~~ requiring treatments in different places, so ~~that~~ as to realize advantages in terms of costs related to the disposal of the slag ~~or~~ and its recycling.

[0006] ~~Other scope of the present invention is to get~~Another is to obtain a plant of fusion of the aluminium for the production of ingots for foundry, according with the preceding purposes, which is completely modular, such that the various units, ~~putable~~ placeable on a track, are separable to make easy both the construction and the assemblage of them, ~~and~~ as well as the maintenance and the substitution ~~because of usury~~.

[0007] ~~Other scope of the present invention is to get~~Another is to obtain a plant of fusion of the aluminium for the production of ingots for a foundry, according with the preceding purposes, having a system of scavenging that allows a smaller waste of thermal energy in the furnace of fusion and simultaneously a cleaning ~~in~~ of the gases from ~~the~~ heavy pollutants before the stack ~~and~~ such that the quality of the air breathed by the employees in the plant , as well as others, is decidedly improved in comparison to ~~the~~ preceding plants.

BRIEF DESCRIPTION OF THE DRAWINGS ~~AND WAY OF REALIZING THE INVENTION~~

[0008] Further characteristics and advantages of the invention will result more clearly from the following description and from the attached drawings, furnished only to ~~only indicative~~ indicate examples and not as limitations~~purpose and not limitative~~.

[0009] The FIG. 1 shows, in a three-dimensional way, the general view of the system of fusion according to the present invention.

[0010] The FIG. 2 shows, in a perspective section, the general view of the system of fusion according to the present invention.

[0011] The FIG. 3 shows a longitudinal section of the general view of the system of

fusion according to the present invention.

[0012] The FIG. 4 shows, schematically and in a lateral point of view, a portion of the spiral element with the channels realized on it.

[0013] The FIG. 5 shows, in a lateral longitudinal view, the equipment ~~of treatment~~ for treating of the slag with ~~the~~ a disposition for the scavenging ~~and the~~ as well as tracks ~~of~~ for moving.

[0014] The FIG. 6 shows, schematically and in a general view, ~~some~~ components of the plant, mainly the store tank of the fused metal and the system of scavenging.

DETAILED DISCRIPTION

[0015] According~~ly~~ to the drawings, the furnace that realizes the fusion of the primary and secondary aluminium ~~(~~scraps~~)~~, is constituted by a cylindrical hollow body (1), with circular section, built in a refractory material, resistant to ~~the~~ thermal stress~~s~~, ~~o~~On an extremity, the body (1) is closed by a porthole (2) used for the loading of the metallic scraps~~;~~, ~~o~~On the other extremity, ~~it is the~~ a window of entry (3) is provided for ~~of~~ the flame of heat of the scrap, ~~and d~~Downward ~~the~~ a hole (4) is provided for the leakage of the fused liquid that, as illustrated by the drawings, is realized in a plain slot.

[0016] The inside diameter of the body (1) changes constantly along its longitudinal ~~axle~~ axis to originate a negative inclination on the horizontal line beginning from the extremity ~~where is~~at the loading porthole (2) up to the extremity where is positioned the hole (4) ~~of~~ for leakage of the melted metal. The difference of inclination among the two extremities, in comparison to the horizontal line, is 2 centimetres ~~for~~ per linear meter of the length of the furnace.

[0017] The furnace is covered by a metallic structure and is kept in a horizontal position by metallic traverse frames (5) that place and creep on the slides (6) held on the metallic supports (7). On both the left and right extremities of the body (1) are ~~the~~ openings (8) and (9) for ~~the~~ scavenging ~~of~~ the fumes that join in a single channel of evacuation (10). On the surface of the inside wall of the body (1) and along all its length, ~~it is~~ a spiral element (11) is provided, whose spires, in a first ~~favourite~~ preferred and illustrated shape, are cylindrical, with circular section, with constant diameter and ~~built in~~ made of a refractory material resistant to the heat and to the mechanical stress due to the action of the scrap in fusion. On the spires of the spiral element (11) and in the bottom side, close

to the wall of the cylinder body (1), are a multiplicity of galleries or channels (12) with a ~~favourite~~ preferred semicircular section.

[0018] A channel ~~of~~ for pouring (13), realized with a suitable inclination and adequately contained in an box (14) insulated and equipped with a window (15), is placed among the hole (4) and the spherical storage basin (16) positioned on a lower plan in a pit. The basin (16) has adequately been described ~~and claimed~~ in the patent WO 02/39044 by the same applicant. The rotating joint (17), in comparison to that described in the aforesaid patent, has a different shape, so ~~that~~ as to realize a continuity of inclination with the channel of pouring (13).

[0019] The principal characteristics of a preferred example of realization of the rotating furnace, for the fusion of the primary and secondary aluminium, are the followings parameters:

[0020] external diameter: 500 centimetres

[0021] inside diameter: 320 centimetres

[0022] thickness of the refractory cement: 90 centimetres

[0023] length of the cylinder: 1200 centimetres

[0024] inclination for the pouring: 24 centimetres

[0025] working temperature: 750-800.degree. C.

[0026] feeding: methane, oil

[0027] heat consumption: 750 Kcal/h for Kg/liquid aluminium produced

[0028] The furnace is maintained in a slow rotation, from one to four revolution/minute, on its mean axle by a gear motor.

DESCRIPTION OF THE PROCESS OF FUSION

[0029] If the melting of secondary aluminium is preferred, at first is realized the selection and mixing of different types of aluminium scraps, whose chemical composition has to be as close as possible to that of the desired alloy. Then the aluminium scraps are set, through the loading porthole (2), in the rotating furnace without ~~addition~~ adding of sodium chloride as a cover agent to prevent the oxidation of the metal.

[0030] Because of the rotation of the furnace and the special inside conformation, it is obtained the mechanical remixing of the scrap in fusion with, simultaneously, an action

of ~~carried~~ carriage of the material by the walls of the furnace. The metal gradually melts and the liquid aluminium begins to rotate in the same sense of rotation of the furnace~~;~~. ~~i~~It will always be positioned in the lower part of the furnace, because the force of gravity ~~is bigger~~ exceeds ~~then~~ the carry force due to the rotation. Moreover, because of the rotational movement, joined to the inside inclination of the furnace, the liquid metal continually slides to the drawing hole (4) that is put in the lowest point, flowing through the small channels (12) transversally set to the spires of the body (11).

[0031] The liquid metal is protected against the oxidation of the air because of its low position, it is not directly licked up by the stream of the warm gases (whose flow is horizontal and situated in the tall part of the furnace), ~~and~~ as well as because it continually flows in the basin (16) where the fused metal is stored, through the pouring channel (13). The slags remain~~s~~ in the tall part and are held by the spiral body (11) and, once all the aluminium is melted and has been stored in the spherical basin, are discharged close to the loading porthole through a channel equipped with a ~~cochlea~~screw conveyor, finishing the process of melting.

[0032] The slags, put in the channel and pushed by the ~~cochlea~~screw conveyor, reaches the module of selection wherein they enter from the extremity (18). The module of selection is constituted by three hollow metallic and coaxial cylinders, one inserted in the other, and open to the left end, and is kept in a horizontal position by booms (19) and metallic traverse frames (20) that place and creep on the slides (21) joined on metallic supports (22) with the interposition of a gear carriage (23).

[0033] The cylinders (24) and (25) have ~~the~~ a surface side equipped with holes, greater on the first cylinder (24) and smaller on the second (25) so that it is possible the pouring of slags of different dimensions. The whole, constituted by the three cylinders, ~~has~~ is put in slow rotation around the longitudinal axle, so ~~have~~ a remixing of the slags occur as soon as they advance along the cylinders pushed by the ~~cochlea~~screw conveyor. The slag, according ~~with~~ to their weight and dimension~~s~~, passes from the first cylinder (24) ~~up~~ to the last one (26). Actually, in the first cylinder (24), with smaller diameter, are the slags essentially constituted by iron parts, steel, copper, that is, material that has ~~few or not~~ been put through the process of fusion or only been put through a small amount; in the second cylinder (25) are the slags of aluminium oxide, while in the third cylinder (26) are

essentially the dusts. It is very interesting ~~the fact~~ to note that the slags, flowing, are selected as well as they are cooled. The slags, so treated, flow out of the extremities of the cylinders and fall in the channels (27), (28), (29) positioned every one below a cylinder and, by a ~~cochlea~~ screw conveyor system present in every channel, are pushed, at almost ambient temperature, in the storage buckets.

[0034] The recovered aluminium oxide is recycled and joined to the feeding charge of fusion. All of the exhaust gases produced in the module of selection and recovery of the slag are carried, through canalizations, to the cap (30), and ~~don't~~ do not escape in the external environment.

[0035] It is very important that the module of selection and recovery of the slag is constituted by units, placeables on tracks, (31), so that they can be open for inspections and maintenance.

[0036] Even if it is not represented in the drawings, the furnace of fusion is also modular, put on carriages that are moved on tracks, to make possible the opening.

[0037] ~~Other~~ Another great innovation is the system of scavenging, constituted by two separate canalizations. The warm gases, originated by the furnace of fusion at a maximum temperature of 300° C., are carried through the pipeline (32) in the underground pit (33) accessible by a porthole of inspection (34). The gases exclusively escape from the furnace of fusion, because of the concomitant action due to the kinetic energy (that originates from their heat), to the expansion that they have by reaching the pit (33), to the loss of pressure produced by the chimney (35) and to the drag force produced by the air flow, at a great speed, that escapes from the extremity (36) of the pipeline (37). In the pit (33) the warm gases, because of the expansion, decrease in temperature and also realize a first falling of the heaviest particles of pollutant agents in the gases.

[0038] All the other gases that escape from the modules, having a lower temperature, are carried to the pipeline (37) by extractors, continuing in an underground pipeline (38) up to the chimney (35) equipped with various devices ~~of~~ for cleaning of the dangerous gases for the environment according to the laws in force.

[0039] Both pipelines (32) and (37) are equipped with a control valve (39) for ~~the~~ automatic passage of the gases. The present system, besides the aforesaid advantages,

realizes also an energetic conservation in the furnace of fusion, because the gases are evacuated in a natural way and only in the quantity necessary to the process of combustion, not having additional quantities of heat for an excess of evacuation of the gases.

[0040] As previously described and illustrated, it is clear that the invention reaches the scope. Dimensions and shapes can be adjusted according to the demands.

ABSTRACT

A plant is provided for the melting of primary and secondary aluminium, provided with a rotating furnace, internally equipped with a spiral element (11), that ~~realizes~~ causes the melting of the aluminium not ~~using~~ requiring use of a salty bath~~,~~. ~~in association with~~ The plant includes a ~~channel of~~ pouring channel (13) ~~set among~~ adjacent ~~the~~ an exit hole (4) of the rotating furnace and ~~the~~ material from the pouring channel enters the spherical store basin (16) positioned ~~on a lower plan, in a pit, and~~ below it, the spherical store being equipped with a rotating joint (17) ~~that realizes a continuity of~~ having a common inclination with the pouring channel ~~of pouring~~ (13) so that what is obtained is the direct and continuous flow of the fused metal in the spherical store ~~tank~~ without interruption of the process of melting. The plant is also equipped with an automatic and continuous system of selection and recovery of the slag of fusion, integrated in the same plant, and a double system of canalization of the gases that allows a good cleaning of the pollutant agents ~~and a remarkable energetic~~ energy conservation in the melting furnace ~~of melting~~.